NIST Latent Workshop vendor panels
Sagem Sécurité

First Session (19 March) - Lights-Out Latent Processing.

Topics for AFIS vendors:

- 1a - Image-only latent matching
- 1b - Automated match determinations for image-only or feature-based latent matching
- 1c - Using increased automation and business practices to make more effective use of latent examiners

Second Session (20 March) - Feature-Based Latent Processing

Topics for AFIS vendors:

- 2a - The CDEFFS extended feature set specification
- 2b - Interoperable latent AFIS feature sets, in light of the National Academies Recommendation #12
- 2c - How to test extended feature sets for latent fingerprint matching
- 2d - Latent matching of palms and lower joints: differences with latent fingerprint AFIS

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1a - Image Only Latent Searching

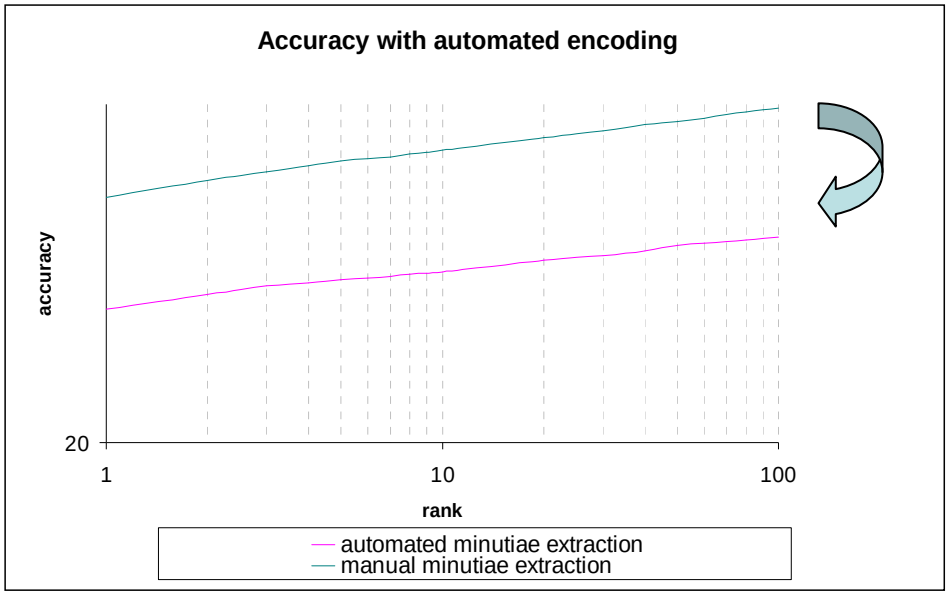
- See http://www.itl.nist.gov/iad/894.03/latent/workshop/proc/P12_JCFondeur_NIST_LT_Lights_Out_1.1.pdf

• Accuracy with automated feature extraction has improved since then …

… but so has accuracy with manual features (feature+image search)

⇒ Accuracy is still 10 to 20% lower with image only search

• Accuracy with automated feature extraction on 2009 AFIS is equivalent to accuracy with manual feature extraction on AFIS designed « several » years ago



Accuracy typically decreases
by 10% to 20%
with Image only search
(depending on latent quality)

Test results on 1350 latents
Background database 1 million fingers

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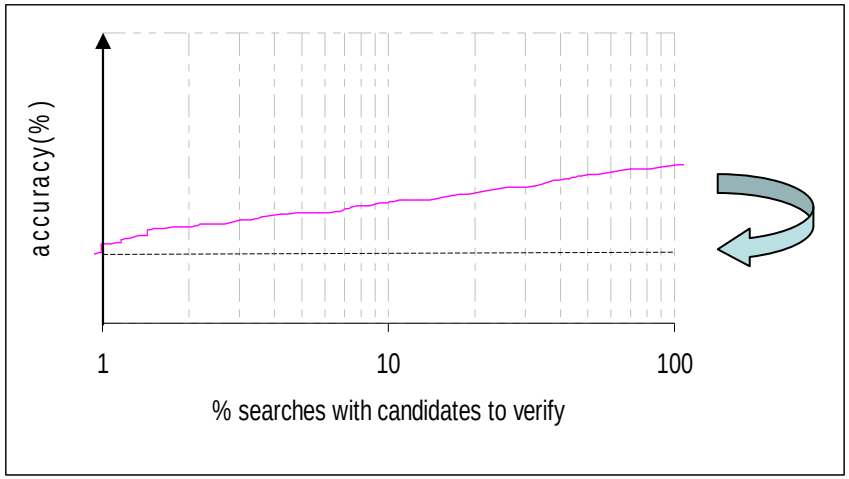
1b - Automated match determinations

- Automated match determination (FAR=1%) is 5 to 15% lower than rank 1 accuracy
  - With automated feature extraction or manual features
  - For Latent to TP search and TP to unsolved latent searches



Accuracy typically decreases
by 5 % to 15%
when threshold is set for 1% verification
(depending on latent quality)

Test results on 1350 latents
Background database 1 million fingers

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1c - Using increased automation and business practices to make more effective use of latent examiners

Suggestion 1a: Process more latents with same expert workload

All latents are not processed today, although some are good enough for AFIS

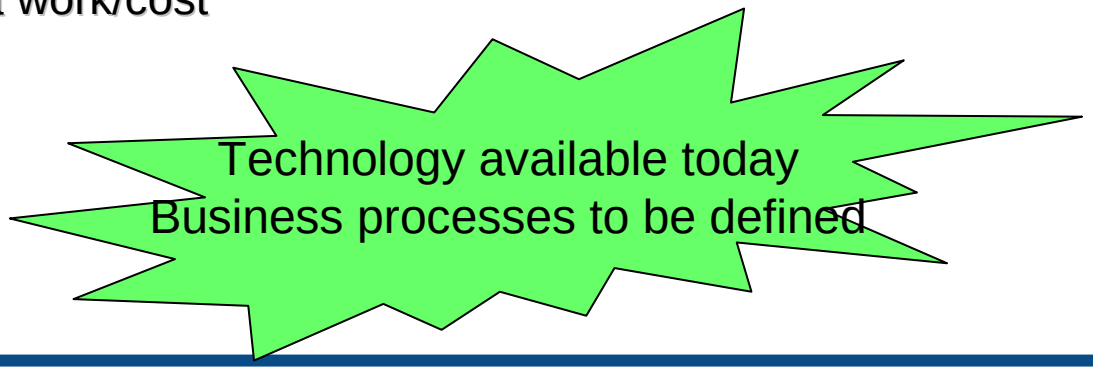
⇒Fully automated search could be launched on these latents

More hits with little extra work/cost

Suggestion 1b: Systematic search on surrounding states' AFIS, National AFIS or international AFIS

New service to be provided by states or national AFIS systems ?

More hits with little extra work/cost



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1c - Using increased automation and business practices to make more effective use of latent examiners

Suggestion 2a: Immediate feedback to investigator on Scene of Crime

⇒**When fast feedback is needed, automatic search can be launched first**

Manual process may be launched too (=> no loss of accuracy)

Improved efficiency in investigation

Enables “suspect elimination” on Scene of Crime

Suggestion 2b: Immediate first response on new cases

⇒ Work around to the “backlog” problem (“quick wins” on new cases)

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1c - Using increased automation and business practices to make more effective use of latent examiners

Suggestion 3 : Automatically process good quality latents

- Clear fingerprint marks with lots of visible minutiae
- Large-area latents
- Needs further study to improve Latent Quality Measurement

=> The expert could concentrate on more difficult latents

Issue = reliable latent quality estimation.

Not recommended today

Suggestion 4 : Bulk latent submission (e.g., paper archive, duplicate search with other states)

- "Bulk" scan by non expert operators or electronic submission
- Automatic minutiae encoding and Selective threshold
- Very few verifications to perform, mostly hits.

Technology available today
Business processes to be defined

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2b - Interoperable latent AFIS feature sets, in light of the National Academies Recommendation #12

- **How to achieve improved AFIS interoperability: by relying on (Image + Feature) search**

- **Features can be**
  - Minutiae (ANSI/NIST, ISO, M1, …)
  - and/or any subset of Extended Feature Data format Draft
    - ex: minutiae confidence and uncertainty, quality map, ridge flow, …
- **Features can be used:**
  - As features directly in matching
  - To guide the feature extract on the latent image

- **Benefit:**
  - Improved matching AND feature extraction
  - Reduced dependency to “between expert” variability
  - Technology might be imperfect but is available today
    - Standards exist or are being developed (NIST/ITL, ISO, M1, EFS, WSQ)
    - AFIS systems can achieve good accuracy with image+feature search

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2c - How to test extended feature sets for latent fingerprint matching

- Some suggestions/comments

1. Test (feature + image) search (on latent side) versus proprietary template (on TP side)

2. Test features independently (one by one) or simultaneously ?

3. Test impact on CMC (Rk 1) and DET (Candidate list reduction) since extended features can improve both
   - And measure impact on resources needed (CPU, template size)

4. Test on same data set for all features (e.g., no dedicated dataset for pores, creases, ..)
   - Real life scenario, takes into account probability of occurrence of each feature
   - Enables comparison of benefits.
   - But requires dataset to be large enough to contain enough data with each feature

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